

A KEY TO THE FEMALES OF THE GENUS
OXYETHIRA (TRICHOPTERA: HYDROPTILIDAE)
FROM THE SOUTHERN UNITED STATES¹

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Abstract.—Associations of females with the males for most species of the genus *Oxyethira* known from the southern United States has made possible the construction of a key to females of that region. Illustrations for 24 of the 27 species are provided along with a discussion of the general morphology of the genital segments of females of the genus. Three new synonyms are proposed: *O. barnstoni* Harper is a synonym of *O. mirabilis* Morton, *O. allosi* Blickle is a synonym of *O. dualis* Morton, and *O. cirrifera* Flint is a synonym of *O. arizona* Ross.

Microcaddisflies (Hydroptilidae) are among the most poorly known Trichoptera, primarily due to their small size. Blickle (1979) provided a key to the males of North American species of the family, but females of few species have been associated with corresponding males (see Table 1). Published illustrations for most of these females are insufficiently detailed to allow comparisons adequate for species discriminations. Furthermore, the majority of species have remained unassociated.

This paper provides illustrations and a key for 24 of the 27 species of *Oxyethira* that are known from across the southern half of the continental United States. A list of these species and their known geographical ranges are provided in Table 1. No females were available of three species; *O. coercens* Morton, *O. leonensis* Kelley, and *O. setosa* Denning. *Oxyethira coercens* is known primarily from the northeastern United States and the latter two from the Florida panhandle and southern Georgia.

Characters of both external and internal morphology of the genital segments are used in the key, such that specimens must be cleared in KOH in

¹ Technical contribution no. 1916 of the South Carolina Agricultural Experimental Station, Clemson University.

Table 1. Species of *Oxyethira* from the southern United States.

Species	Known Distribution			Previous Descriptions of Female	
	States	Mountain	Piedmont or Plateau		Coastal Plain
<i>O. abacatia</i> Denning	Fla., Ga., S.C.	X	X	X	None
<i>O. aculea</i> Ross	Ariz., N. Mex., Okla.	X	X		None
<i>O. arizona</i> Ross	Ariz.		X		Flint, 1968a
<i>O. azteca</i> (Mosely)	Tex.		X		Flint, 1968b
<i>O. coercens</i> Morton	Okla., Va.	X			None
<i>O. dualis</i> Morton	Ark., Ariz., N. Mex., Tenn., Tex., Va.	X			Ross, 1944
<i>O. dunbartonensis</i> Kelley	Ga., S.C.	X	X		Kelley, 1981
<i>O. elerobi</i> (Blickle)	Fla., S.C.			X	Kelley, 1981
<i>O. florida</i> Denning	Fla.			X	Botosaneanu, 1979
<i>O. forcipata</i> Mosely	Ga., N.C., S.C., Va.	X	X		None
<i>O. glasa</i> (Ross)	Fla., Ga., La., Okla., S.C.			X	None
<i>O. grisea</i> Betten	S.C., Tenn., Va.	X	X		None
<i>O. janella</i> Denning	Fla., Ga., La., Miss., S.C.	X	X	X	Flint, 1968a
<i>O. leonensis</i> Kelley	Fla.			X	None
<i>O. lumosa</i> Ross	Fla., Ga., S.C.		X	X	None
<i>O. maya</i> Denning	Fla., Ga.			X	None
<i>O. michiganensis</i> Mosely	Ga., S.C., Va.	X			None
<i>O. novasota</i> Ross	Fla., Ga., La., Miss., S.C., Tex.			X	None ("novasota" of Ross, 1944, is actually <i>verna</i>)
<i>O. pallida</i> (Banks)	Ala., Fla., Ga., La., Miss., Okla., S.C.	X	X	X	Ross, 1944
<i>O. rivicola</i> Blickle and Morse	Tenn., Va.	X			None
<i>O. rossi</i> Blickle and Morse	Tenn.	X			None
<i>O. serrata</i> Ross	Tenn.	X			Ross, 1944
<i>O. setosa</i> Denning	Fla., Ga.			X	None
<i>O. sininsigne</i> Kelley	Fla., La., S.C.			X	Kelley, 1981
<i>O. ulmeri</i> (Mosely)	Tex.		X		None
<i>O. verna</i> Ross	Fla., La., S.C., Tex.			X	Denning, 1947; Ross, 1944 (as "novasota")
<i>O. zeronia</i> Ross	Fla., Ga., La., N.C., S.C., Tenn., Va.	X	X	X	None

Table 2. Species groups of *Oxyethira* in North and Central America (adapted from Marshall, 1979).

Azteca Group	Grisea Group
<i>azteca</i> (Mosely)	<i>allagashensis</i> Blickle
<i>janella</i> Denning	<i>coercens</i> Morton
<i>quelinda</i> Botosaneanu	<i>dunbartonensis</i> Kelley
<i>puertoricensis</i> Flint	<i>grisea</i> Betten
Bidentata Group	<i>lumosa</i> Ross
<i>abacatia</i> Denning	<i>novasota</i> Ross
<i>aeola</i> Ross	<i>rivicola</i> Blickle and Morse
<i>anabola</i> Blickle	<i>sida</i> Blickle and Morse
<i>mirabilis</i> Morton	Pallida Group
<i>barnstoni</i> Harper, new synonym	<i>alaluz</i> Botosaneanu
Distinctella Group	<i>arizona</i> Ross
<i>araya</i> Ross	<i>cirrifera</i> Flint, new synonym
<i>serrata</i> Ross	<i>campesina</i> Botosaneanu
<i>setosa</i> Denning	<i>maya</i> Denning
Dualis Group	<i>pallida</i> (Banks)
<i>dualis</i> Morton	<i>verna</i> Ross
<i>allosi</i> Blickle, new synonym	Ulmeri Group
<i>sininsigne</i> Kelley	<i>aculea</i> Ross
Falcata Group ¹	<i>florida</i> Denning
<i>rossi</i> Blickle and Morse	<i>simulatrix</i> Flint
Forcipata Group	<i>ulmeri</i> (Mosely)
<i>forcipata</i> Mosely	Zeronia Group
<i>michiganensis</i> Mosely	<i>glasa</i> (Ross)
<i>obtusatus</i> Denning	<i>jamaicensis</i> Flint
	<i>leonensis</i> Kelley
	<i>zeronia</i> Ross
	Uncertain status
	<i>elerobi</i> (Blickle)

¹ Primarily Palearctic.

order to see the distinguishing characters of many of these species. Details of the clearing procedure were provided by Ross (1944). Morphological nomenclature is based upon the work of Nielsen (1980). Species groups recognized herein (Table 2) have been modified from those of Marshall (1979). Voucher specimens are in the collections mentioned in Acknowledgments and in the Clemson University Insect Museum.

Three synonyms were discovered in the course of this research. Examination of specimens of *O. mirabilis* Morton from the British Museum (Natural History) showed them to be identical with *O. barnstoni* Harper. Type-specimens of both *O. arizona* Ross and *O. cirrifera* Flint were studied and found to be synonyms. Blickle (1980) did not mention *O. dualis* Morton in

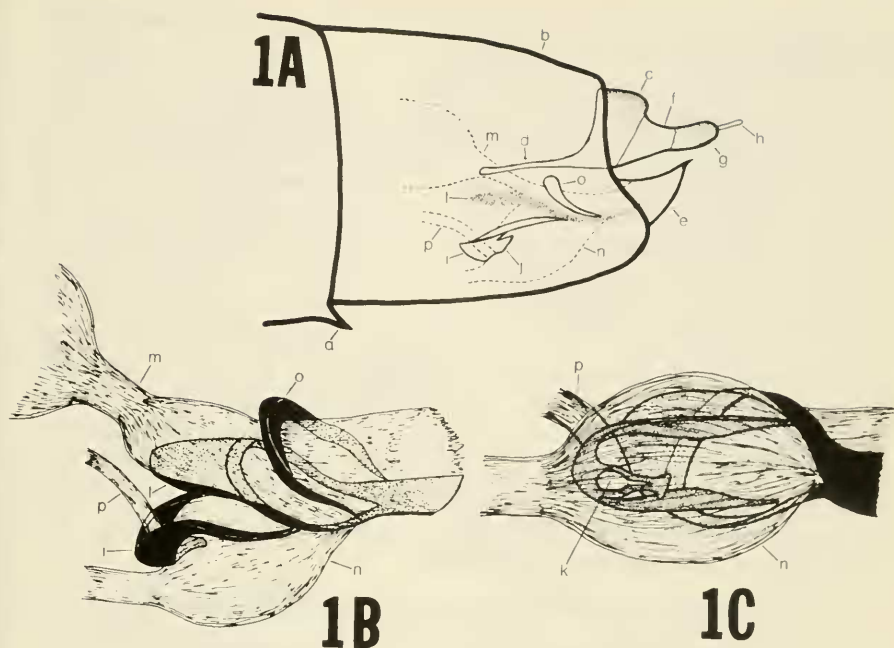


Fig. 1. Generalized views of genital segments of *Oxyethira* females. A. Left lateral view. B. Left dorsolateral oblique view of internal sclerites. C. Left ventrolateral oblique view of internal sclerites. a = apicomeral spur of segment VI; b = segment VII; c = tergum VIII; d = apodeme of tergum VIII; e = sternum VIII; f = tergum IX; g = tergum X; h = cercus; i = spermathecal sclerite; j = spermathecal process; k = foramen of spermathecal process; l = horizontal lamella; m = collateral duct; n = venter of oviduct; o = posterior ring sclerite; p = spermathecal duct.

his diagnosis of *O. allosi* Blickle. A review of the illustrations of each species reveals their synonymy.

GENERAL MORPHOLOGY

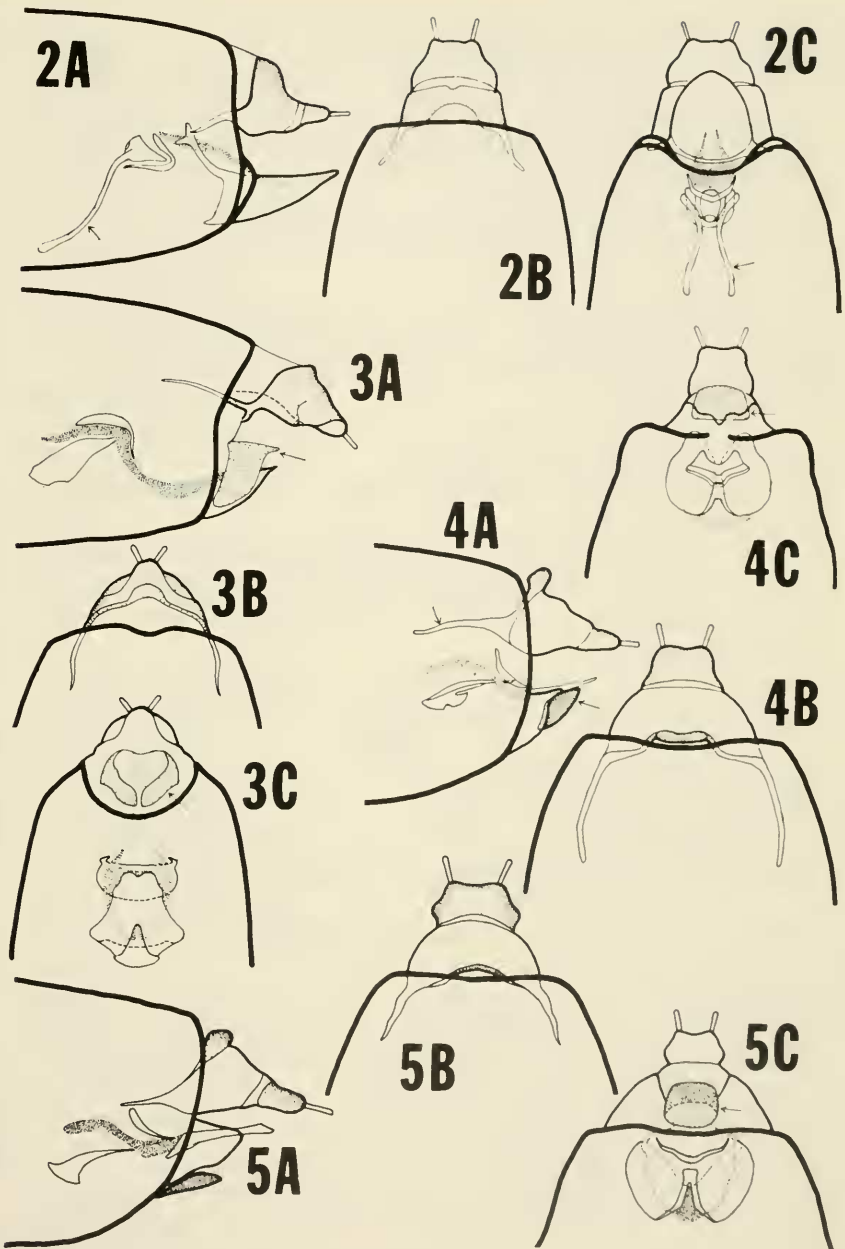
Nielsen (1980) reviewed the internal and external anatomy of the genital segments of female Trichoptera, including the microcaddisfly genera *Agraylea*, *Hydroptila* and *Orthotrichia*. Although similar in general features to these genera, several modifications can be noted in *Oxyethira* (Fig. 1). In females of most species of the genus, segment VIII is incomplete with a short tergum. Laterally the segment narrows into apodemes which proceed anteriorly $\frac{1}{3}$ to $\frac{1}{2}$ the length of segment VII. Ventrally, segment VIII is represented by a short sternum which is sclerotized to various degrees in different species. In some species, sclerites are present on sternum VIII and still others have sternum VIII retracted within segment VII. Segment IX is

reduced to a short, lightly sclerotized tergum. Tergum X is more heavily sclerotized with a pair of cerci distally.

Several sclerites are associated with the internal reproductive system (Figs. 1A-C). The spermathecal sclerite is similar to that of other Trichoptera with a spermathecal process originating anteroventrally. A keyhole-shaped foramen can be seen ventrally in the spermathecal process through which the spermathecal duct enters dorsally. The sclerotized dorsum of the oviduct, which Nielsen called the horizontal lamella, is prominent in most *Oxyethira* females. In many species the posteriolateral corners of this sclerite continue posteroventrally to encircle the oviduct and fuse ventrally, forming the floor of the oviduct. Immediately posterior to the horizontal lamella the collateral duct enters the dorsum of the oviduct. Further posteriorly another sclerite nearly encircles the oviduct, although it is reduced to a membranous structure in many species. Nielsen did not mention a homolog for this sclerite in other hydroptilids; thus, we refer to it here as the "posterior ring sclerite." Species of the *azteca* group bear sclerotized processes supporting the oviduct ventrally which do not appear to be present in other species groups (Figs. 2A, C).

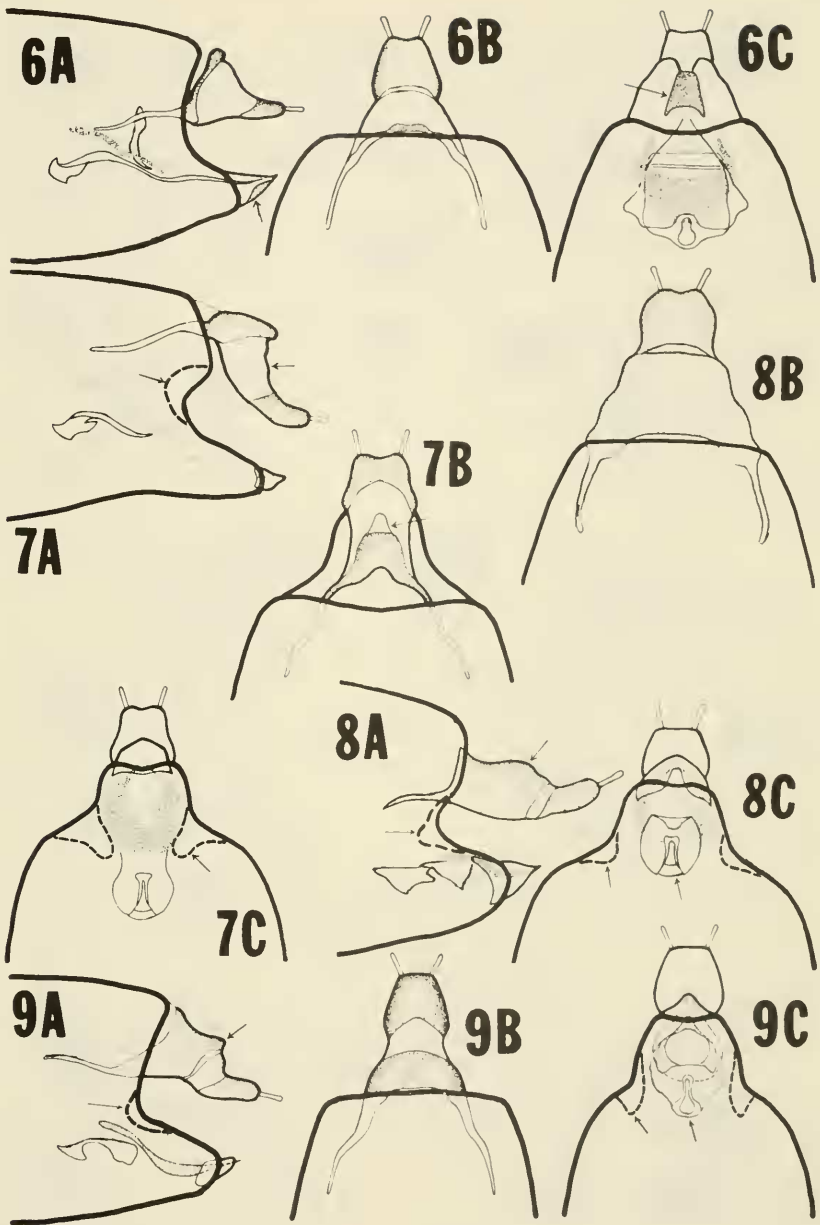
KEY TO THE FEMALE *OXYETHIRA* FROM THE SOUTHERN UNITED STATES

1. Pair of sclerotized parallel rods proceeding anteroventrally from spermathecal sclerite, nearly reaching sternum VII (Figs. 2A, C) *janella* Denning
- Pair of rods shorter or lacking beyond spermathecal sclerite (Figs. 3A, C) 2
2. Sternum VIII with 1 or 2 distinct sclerites ventrally (Figs. 3A, C; 4A, C) 3
- Sternum VIII without ventral sclerites, retracted within segment VII, or entire sternum moderately sclerotized (Figs. 22A, C) 6
3. Sternum VIII with ventral paired sclerites which are congruent anteriorly, diverging posteriorly (Figs. 3A, C); apico-mesal process lacking from sternum VI *elerobi* (Blickle)
- Sternum VIII with single sclerite (Figs. 4C; 6C); apico-mesal process present on sternum VI 4
4. Sternite VIII broad, as wide as, or wider than, long (Figs. 4C; 5C) 5
- Sternite VIII small, longer than wide, trapezoidal (Figs. 6A, C) *dunbartonensis* Kelley
5. Apodemal rods of segment VIII proceeding anteriorly as far as, or farther than, spermathecal sclerite (Figs. 4A, B) *novasota* Ross
- Apodemal rods of segment VIII not proceeding as far anteriorly as spermathecal sclerite (Figs. 5A, B) *grisea* Betten

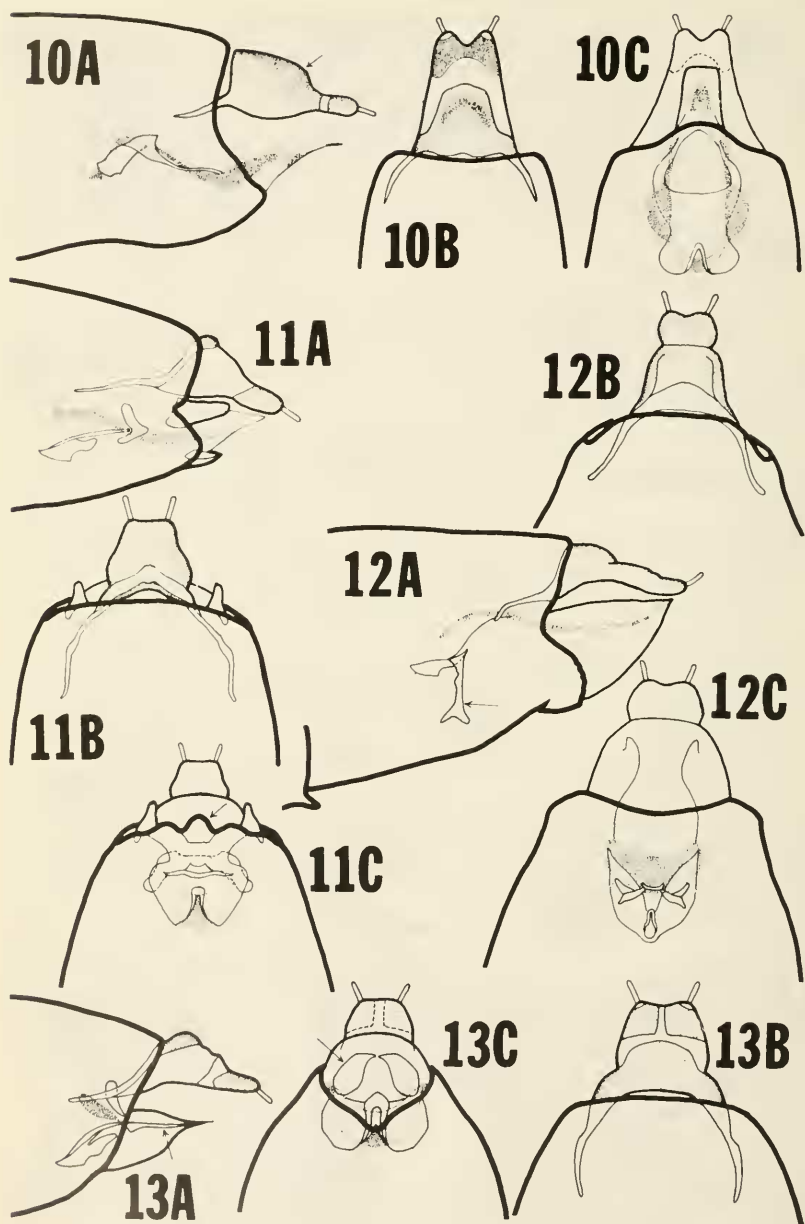


Figs. 2-5. Terminal abdominal segments of *Oxyethira* spp., females. 2, *O. janella*. 3, *O. elerobi*. 4, *O. novasota*. 5, *O. grisea*. A, Lateral. B, Dorsal. C, Ventral.

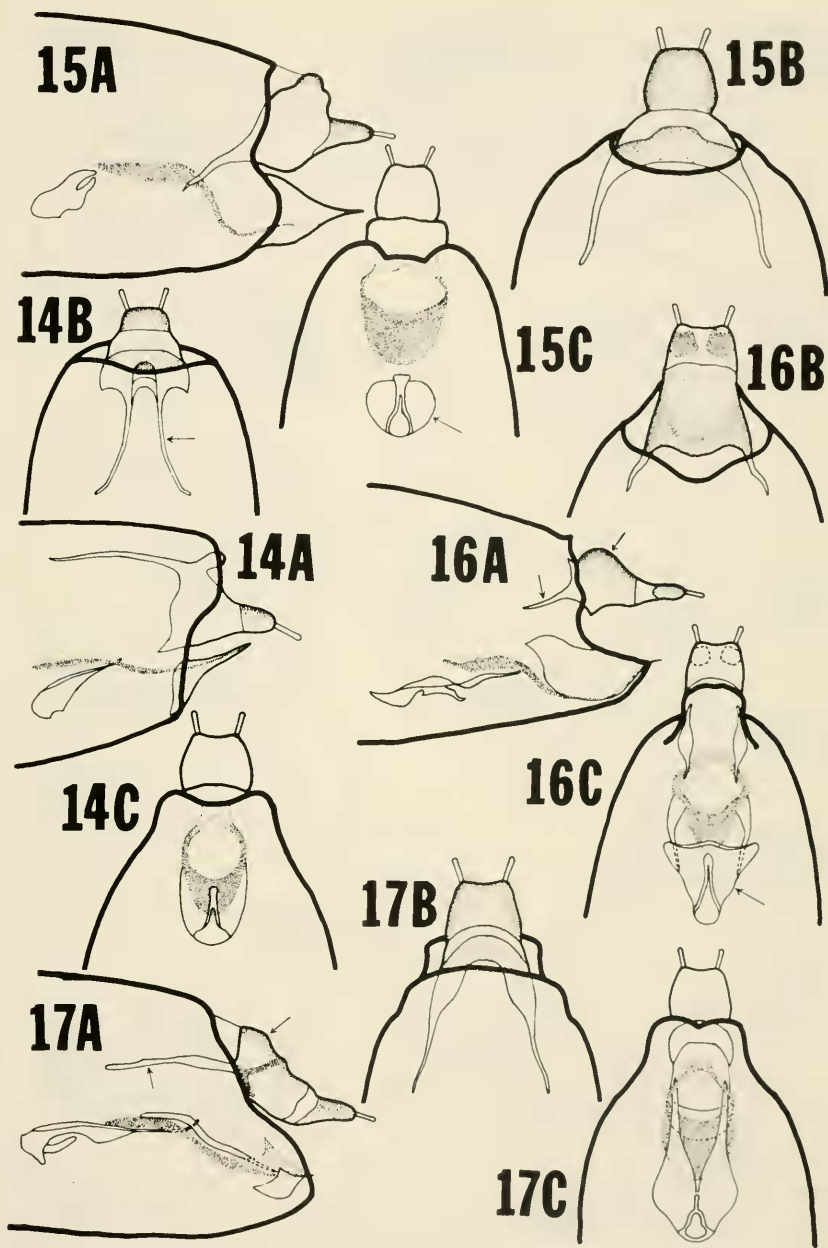
6. Segment VII infolded laterally (Figs. 7A, C; 8A, C; 9A, C) 7
 – Segment VII not infolded laterally (Figs. 10A, C) 9
7. Tergum IX elongate (Fig. 7A); distal end of tergum VIII nipple-shaped in dorsal view (Fig. 7B) *arizona* Ross
 – Tergum IX shorter (Figs. 8A; 9A); distal end of tergum VIII broadly rounded or truncate in dorsal view (Figs. 8B; 9B) 8
8. Spermathecal sclerite broadly rounded anteriorly (Fig. 8C); terga VIII and IX flattened dorsally in lateral view (Fig. 8A)
 *maya* Denning
 – Spermathecal sclerite more acutely rounded anteriorly (Fig. 9C); tergum VIII with knoblike process dorso-distally and tergum IX proceeding ventrally from tergum VIII in lateral view (Fig. 9A) ...
 *pallida* (Banks)
9. Tergum VIII large, longer than wide; tergum IX reduced; tergum X heavily sclerotized (Figs. 10A, B) *glasa* (Ross)
 – Tergum VIII small, wider than long; tergum X usually lightly sclerotized (Figs. 11B; 13B) 10
10. Posterior margin of sternum XII sinuate, with tongue-shaped process in ventral view (Fig. 11C) *rivicola* Blicke and Morse
 – Posterior margin of sternum VII not both sinuate and tongue-shaped (Fig. 14C) 11
11. Sclerotized process proceeding ventrally from spermathecal sclerite, appearing distally forked in lateral and ventral views (Figs. 12A, C) *azteca* (Mosely)
 – No such sclerite proceeding ventrally from spermathecal sclerite (Fig. 15A) 12
12. Posterior end of oviduct floor with paired sclerites (Figs. 13 A,C); paired, lightly sclerotized tergites on tergum X (Fig. 13B)
 *rossi* Blicke and Morse
 – Oviduct floor without paired sclerites; sclerotized tergites usually absent from tergum X (Fig. 18C) 13
13. Terga VIII, IX and X and sternum VIII largely retracted within segment VII (Figs. 14A–C); apodemes of segment VIII nearly parallel in dorsal view and much nearer each other than to lateral walls of segment VII (Fig. 14B) *michiganensis* Mosely
 – Terminal segments exerted in normal position, apodemes of VIII much farther apart (Fig. 17A) 14
14. Spermathecal sclerite visible as distinct oval structure in ventral view and set anteriorly to horizontal lamella (Figs. 15A, C)
 *sininsigne* Kelley
 – Spermathecal sclerite not anterior to horizontal lamella and may or may not be oval (Fig. 14C) 15



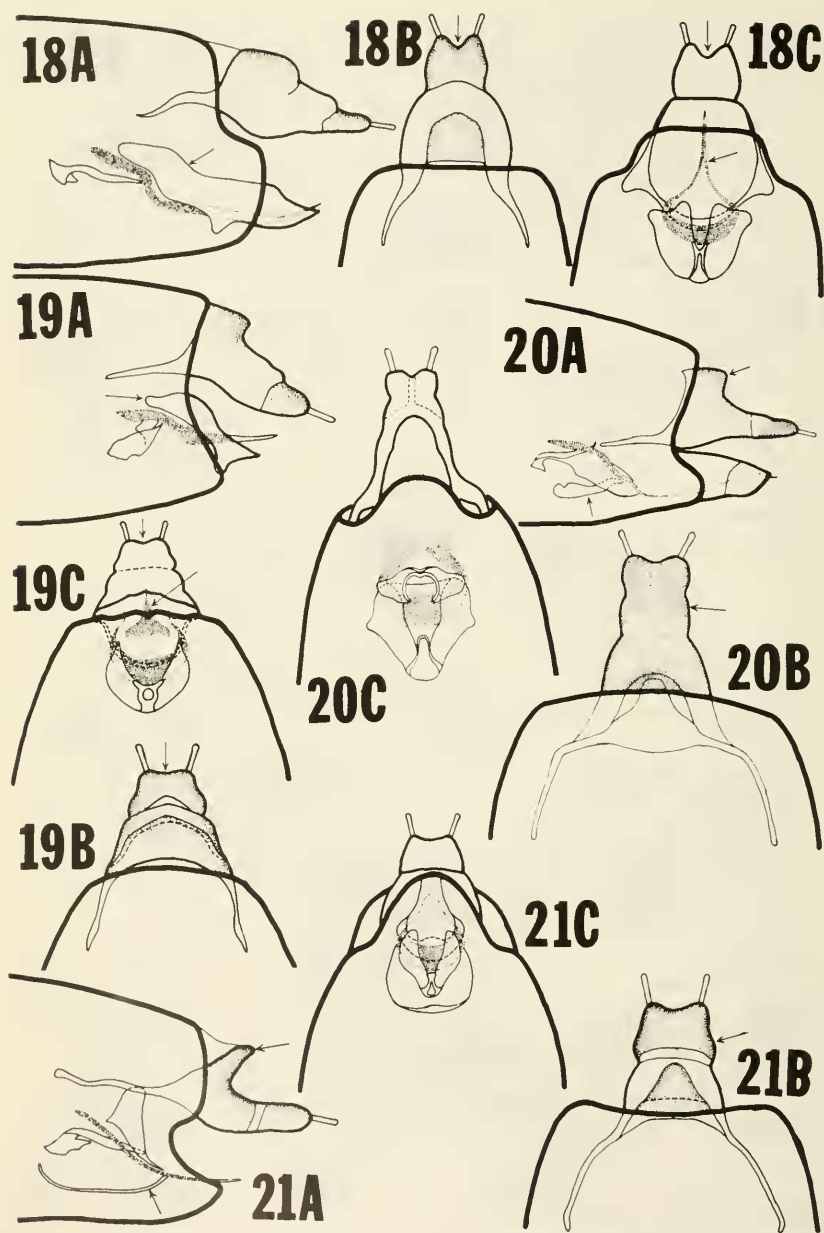
Figs. 6-9. Terminal abdominal segments of *Oxyethira* spp., females. 6, *O. dunbartonensis*. 7, *O. arizona*. 8, *O. maya*. 9, *O. pallida*. A, Lateral. B, Dorsal. C, Ventral.



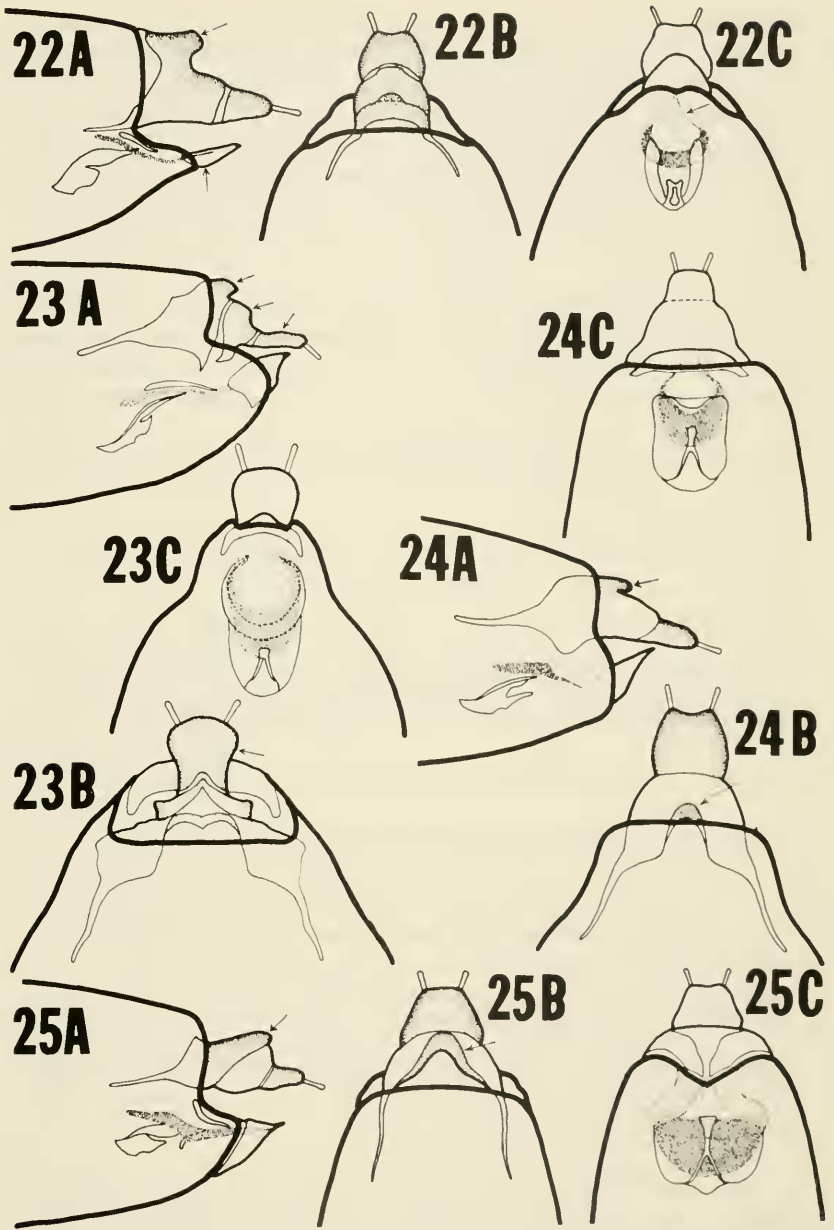
Figs. 10-13. Terminal abdominal segments of *Oxyethira* spp., females. 10, *O. glasa*. 11, *O. rivicola*. 12, *O. azteca*. 13, *O. rossi*. A. Lateral. B. Dorsal. C. Ventral.



Figs. 14-17. Terminal abdominal segments of *Oxyethira* spp., females. 14, *O. michiganensis*. 15, *O. sinisigne*. 16, *O. dualis*. 17, *O. abacatia*. A, Lateral. B, Dorsal. C, Ventral.



Figs. 18-21. Terminal abdominal segments of *Oxyethira* spp., females. 18, *O. florida*. 19, *O. aculea*. 20, *O. zeronia*. 21, *O. verna*. A, Lateral. B, Dorsal. C, Ventral.



Figs. 22-25. Terminal abdominal segments of *Oxyethira* spp., females. 22, *O. ulmeri*. 23, *O. serrata*. 24, *O. forcipata*. 25, *O. lumosa*. A, Lateral. B, Dorsal. C, Ventral.

15. Spermathecal sclerite extending anteriorly at least $\frac{2}{3}$ the length of segment VII; tergum VIII broadly rounded dorsally in lateral view (Figs. 16A; 17A) 16
- Spermathecal sclerite extending anteriorly less than $\frac{1}{2}$ the length of segment VIII; tergum VIII with bulbous process dorsally (Figs. 24A; 25A) or acutely pointed (Figs. 20A; 21A) 17
16. Spermathecal sclerite triangular in ventral view (Fig. 16C); apodemes of segment VIII shorter than segment dorsally (Figs. 16A, B) *dualis* Morton
- Spermathecal sclerite more nearly diamond-shaped in ventral view (Fig. 17C); apodemes of segment VIII long, much longer than segment dorsally (Figs. 17A, C) *abacatia* Denning
17. Floor of oviduct with sclerotized area attenuated posteriorly (Figs. 18C; 19C; 22C) 18
- Sclerotized area on floor of oviduct broader posteriorly (Figs. 20C; 21C) 20
18. Sternum VIII extending anteriorly into segment VII to encircle oviduct and fuse dorsally (Figs. 18A; 19A); attenuate sclerite continuing posteriorly as spinelike process (Figs. 18C; 19C); tergum VIII rounded or pointed postero-dorsally (Figs. 18A; 19A) 19
- Sternum VIII not extending into segment VII (Figs. 22 A,C); attenuate sclerite not continuing posteriorly as spinelike process; tergum VIII with truncate process in lateral view (Fig. 22A) *ulmeri* (Mosely)
19. Tergum X moderately excised distally in dorsal view (Figs. 18B, C) *florida* Denning
- Tergum X only slightly excised distally in dorsal view (Figs. 19B, C) *aculea* Ross
20. Apico-mesal process absent from venter VI or very minute; dorso-distal end of tergum VIII angulate in lateral view, dropping sharply posteriorly (Figs. 20A; 21A) 21
- Apico-mesal process present on venter VI (Fig. 1A); dorso-distal end of tergum VIII bulbous 22
21. Tergum X with two sclerites dorsally (Fig. 20B); floor of spermatheca sclerotized only posteriorly (Figs. 20A, C); apex of tergum VIII angled at approximately 90° in lateral view (Fig. 21A) *zeronia* Ross
- Tergum X only lightly sclerotized in a single plate (Fig. 21B); floor of spermatheca completely sclerotized, oval in ventral view (Figs. 21A, C); apex of tergum VIII protruding postero-dorsally, acutely angled in lateral view (Fig. 21A) *verna* Ross
22. Tergum X widening distally in dorsal view (Figs. 23B, C); terga VIII, IX and X distinct (Figs. 23A, B) *serrata* Ross

- Tergum X narrowing distally in dorsal view; terga VIII, IX and X not clearly distinct (Figs. 24A, B; 25A, B) 23
- 23. Distal end of tergum VIII not proceeding posteriorly as far as anterior end of tergum X in dorsal view (Figs. 24A, B)
..... *forcipata* Mosely
- Distal end of tergum VIII proceeding posteriorly as far as anterior end of tergum X (Figs. 25A, B) *lumosa* Ross

ACKNOWLEDGMENTS

We express our appreciation to O. S. Flint, Jr., of the National Museum of Natural History, Washington, D.C., David C. Etnier of the University of Tennessee, Knoxville, D. G. Denning of Moraga, California, and Peter C. Barnard of the British Museum (Natural History), London, for the loan of specimens that helped make this research possible. A portion of this work was funded as part of a baseline study for the U.S. Department of Energy's Savannah River National Environmental Research Park, Aiken, South Carolina.

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